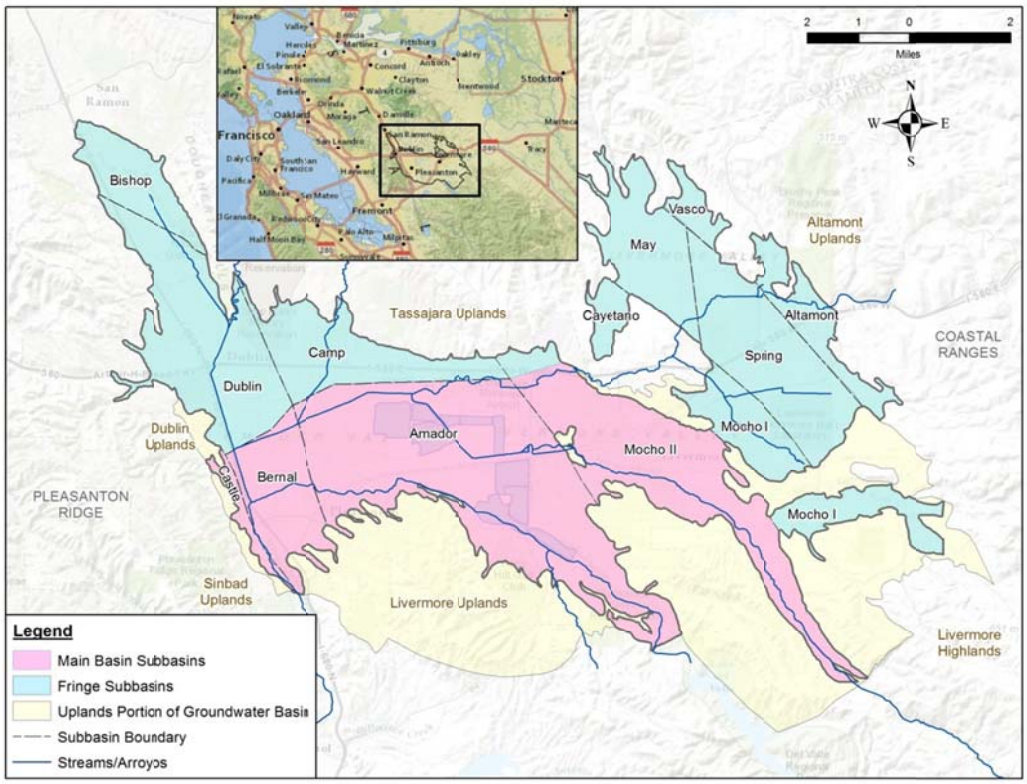
Executive Summary

Introduction

The Annual Report for the Groundwater Management Program for the 2014 Water Year (October 1, 2013 through September 30, 2014), the format of which has changed from previous years, summarizes this year's groundwater monitoring, evaluation, and management efforts in the Livermore Valley Groundwater Basin.

Figure ES-1: Livermore Valley Groundwater Basin



Results for each of the monitoring, evaluation, and management programs are summarized in this Executive Summary, while the details are provided in the sections that follow:

INTRODUCTION:

- Section 1: Background

GROUNDWATER MONITORING PROGRAMS:

- Section 2: Climatological
- Section 3: Surface Water
- Section 4: Chain of Lakes
- Section 5: Groundwater Elevations

- Section 6: Groundwater Quality
- Section 7: Land Surface Elevation
- Section 8: Wastewater and Recycled Water
- Section 9: Land Use

GROUNDWATER MANAGEMENT PROGRAMS:

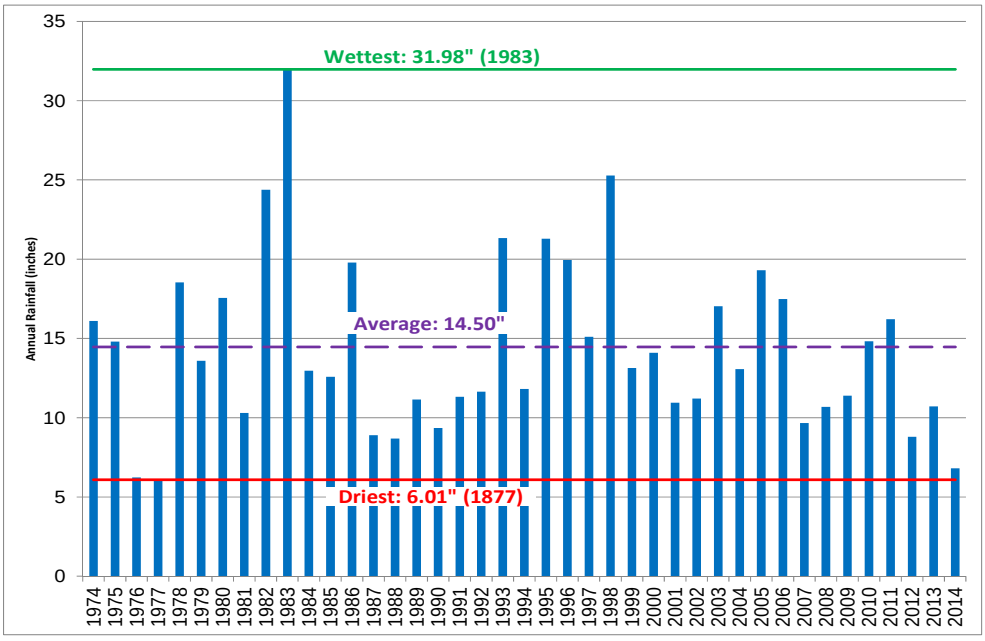
- Section 10: Groundwater Storage Management for Sustainability
- Section 11: Groundwater Supply Sustainability
- Section 12 Water Quality Sustainability

All of the data included in this report are conveyed based on the Water Year (WY, October 1 through September 30); however, due to other reporting obligations, some information in Section 11 regarding retailer pumping is also compiled and reported on a Calendar Year basis (CY, January 1 through December 31).

Climatological (Section 2)

For the 2014 WY, rainfall in the Livermore-Amador Valley was only 50% of average, and the third water year in a row with below-average rainfall. The total rainfall for Monitoring Station 15E in Livermore was 6.80 inches for the 2014 WY, which was the fifth lowest overall since the recordkeeping began in 1871. The driest water year record for Monitoring Station 15E is 6.01 inches in 1877. The aquifer replenishment from percolating rainfall was estimated to be 1,169 acre-feet (AF) which is about 27% of normal.

Figure ES-2: Sta. 15E Rainfall (inches), 1974-2014 Water Years



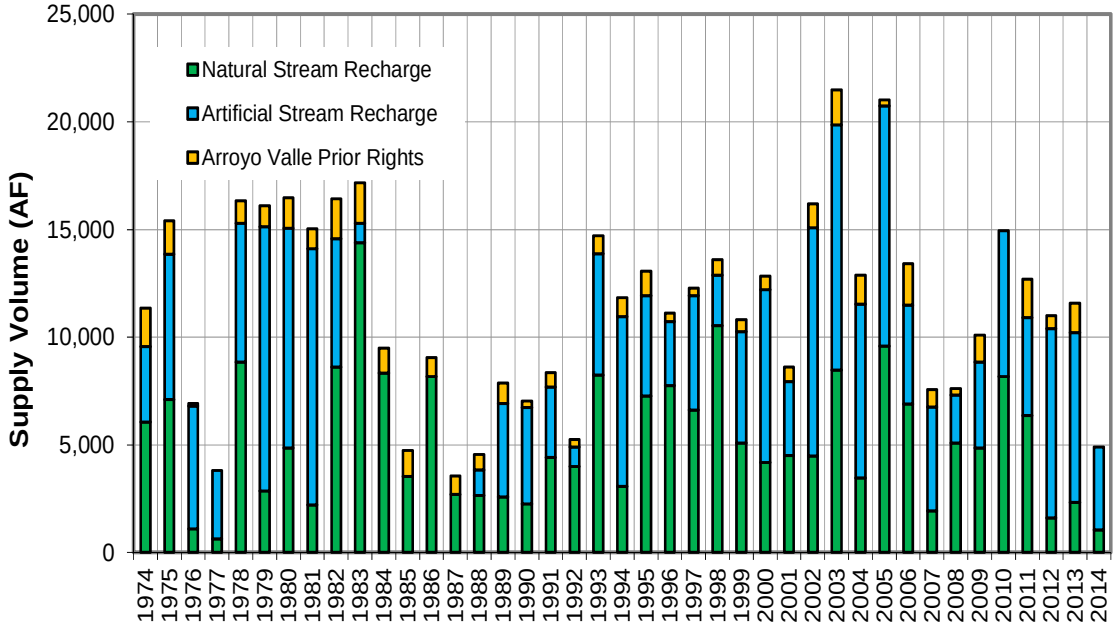
The Zone 7 network average evapotranspiration (ETo) was approximately 49.26 inches in the 2014 WY, which is about 106% of the historical network average.

Surface Water (Section 3)

As a result of the low rainfall in the watershed and throughout Northern California during 2014 WY, natural and artificial streamflows in the Valley's arroyos were only a fraction of their normal. Only 1% of the historical average runoff was measured at the two stream gages that monitor flows from the upper watersheds (Arroyo Mocho near Livermore [AMNL] and Arroyo Valle below Lang Canyon [AVBLC). Zone 7 arranged for the variable releases of State Water Project (SWP) water to the Arroyo Mocho and Arroyo Del Valle between October 1 and March 30 for Zone 7's artificial aquifer recharge operations. The releases were then discontinued for the rest of the water year due to SWP allocation cutbacks made by California Department of Water Resources (DWR). Arroyo Mocho was dry at Arroyo Mocho Hageman (AMHAG) for 77% of the water year, and Arroyo Del Valle went dry at ADVP in Pleasanton on April 28. The total stream recharge (natural and artificial) for the water year was 4,891 AF, which is 43% of average.

The dry conditions on Arroyo Del Valle precluded any water quality sampling after April 28. A total of 14,128 AF flowed past Arroyo De La Laguna at Verona (ADLLV) and out of the Valley in the 2014 WY. This is about 27% of the average outflow between 1970 and 2013.

Figure ES-3: Stream Recharge Volumes (AF), 1974 to 2014 Water Years



Chain of Lakes (Section 4)

Aggregate mining activities continued by Vulcan Materials (formerly Calmat) and Cemex (formerly RMC and Lonestar) in the central part of the groundwater basin in the 2014 WY. Vulcan Materials continued their mining in pit R24 (future Lake E), whereas Cemex continued mining in pit P42, located just north of Arroyo Valle (in the future Lake B area). As a result of mining pit dewatering activities to facilitate the extraction of aggregate resources, Vulcan

discharged 1,260 AF of groundwater to the Arroyo Mocho between October 1 and December 7, 2013, of which about 410 AF re-percolated and 850 AF flowed out of the Valley. Starting December 8, 2013, Vulcan routed its intermittent releases to Cope Lake, where Zone 7 took over management of these water resources that would have otherwise flowed out of the basin via the Arroyo Mocho.

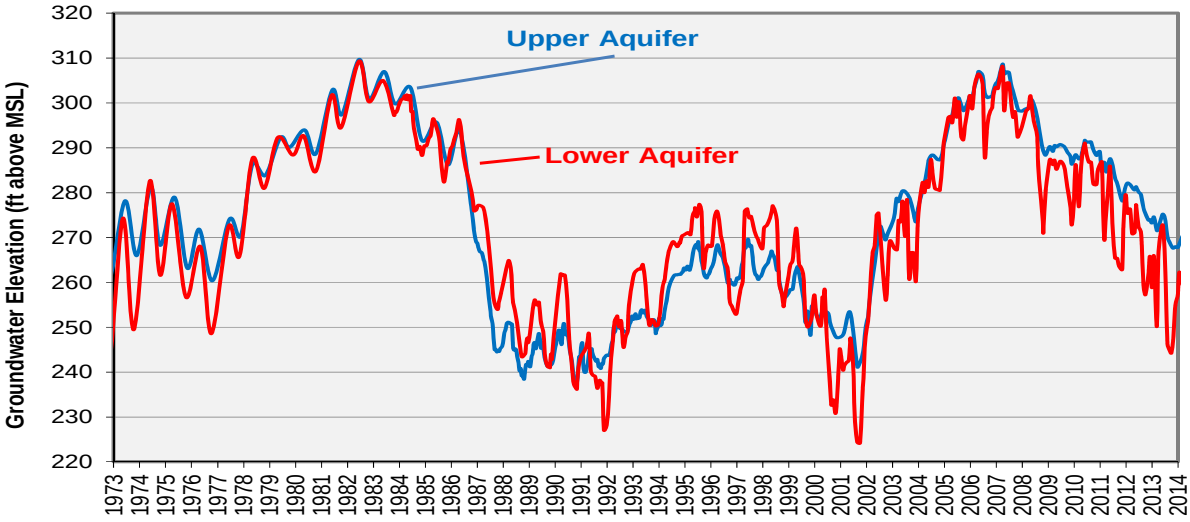
In the 2014 WY, 5,420 AF of Vulcan's discharge was captured in Cope Lake. A pipeline between Cope Lake and Lake I was installed in May 2014 that allowed approximately 881 AF of the discharged water to transfer from Cope Lake to Lake I for groundwater recharge. CEMEX did not discharge any groundwater to Arroyo Del Valle in the 2014 WY, however, evaporation from all the mining pits accounted for approximately 3,648 AF. Evaporation and exportation of moisture contained in the mined aggregate accounted for approximately an additional 700 AF of groundwater loss in the 2014 WY.

Total dissolved solids (TDS) concentrations in the mining area pits ranged from about 316 milligrams per liter (mg/L) to over 1,400 mg/L, with the better water quality (lower TDS concentrations) found in the ponds that are intercepting groundwater and artificially recharged surface water. The higher TDS concentrations are found, for the most part, in the clay-lined ponds, where evaporation is concentrating the minerals in the water.

Groundwater Elevations (Section 5)

As is usually the case, the 2014 WY groundwater levels varied with seasonal recharge and extraction. Generally the highest water levels are found in spring, at the end of the rainy season, and lowest at the end of the high demand summer/fall seasons. During the first half of the 2014 WY, groundwater elevations rose due to rainfall, artificial recharge, and subsequent reduced pumping. However, during the second half of the year, groundwater elevations leveled off and then dropped as rainfall recharge decreased and water demand increased. As a net result, water levels at the end of the water year fell between 6 and 21 feet below the levels observed at the end of the 2013 WY, in both the upper and lower aquifers.

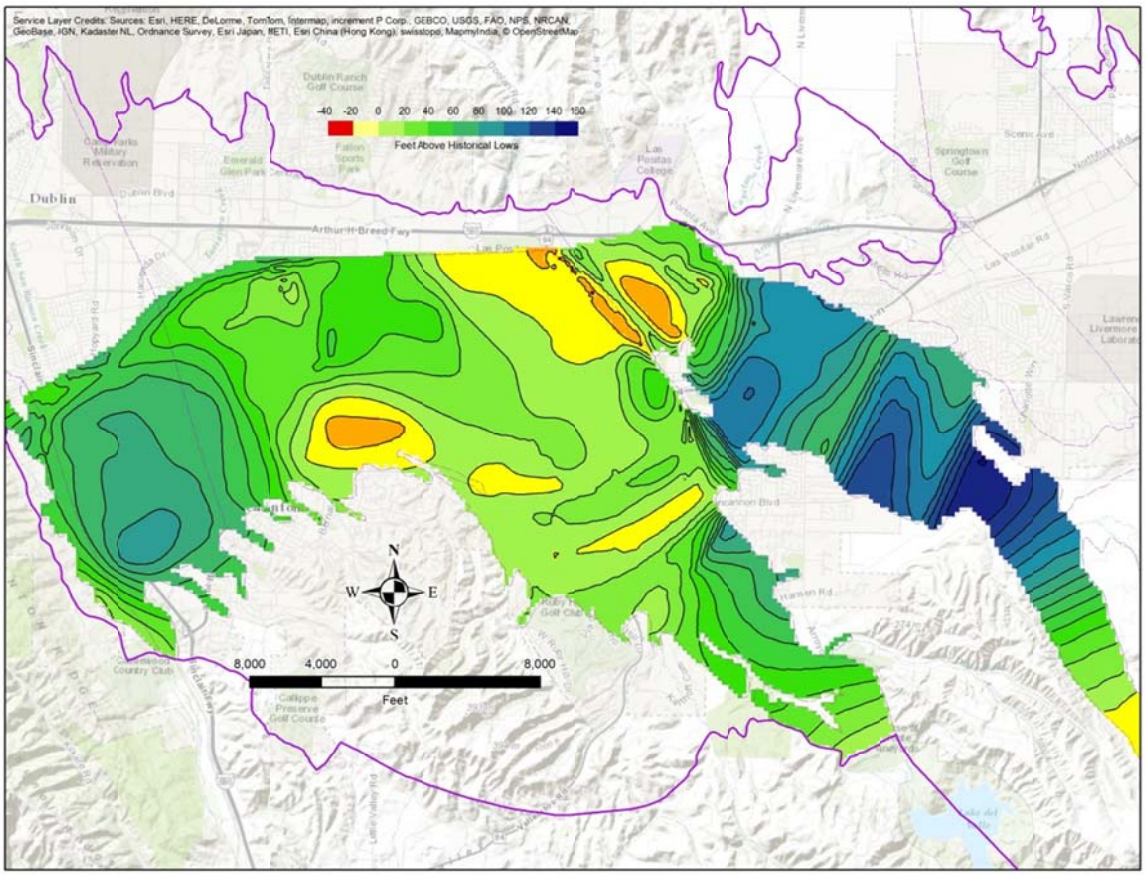
Figure ES-4: Key Well Water Levels in Amador West Subbasin (1973 to 2014)



At the end of the water year, groundwater levels in the lower aquifer in the vicinity of Zone 7's municipal wells were 25 to 69 ft above historical lows.

In the south-central portion of the Main Basin, in the vicinity of Pleasanton Well No 8, groundwater levels reached the theoretical historical low. This area of apparent historical low exceedance (shown in *Figure ES-5*), is the result of historical low elevations being approximately 10 feet higher and groundwater elevations being 20 feet lower than the surrounding areas.

Figure ES-5: Water Levels above Historical Lows (Fall 2014 Water Year)



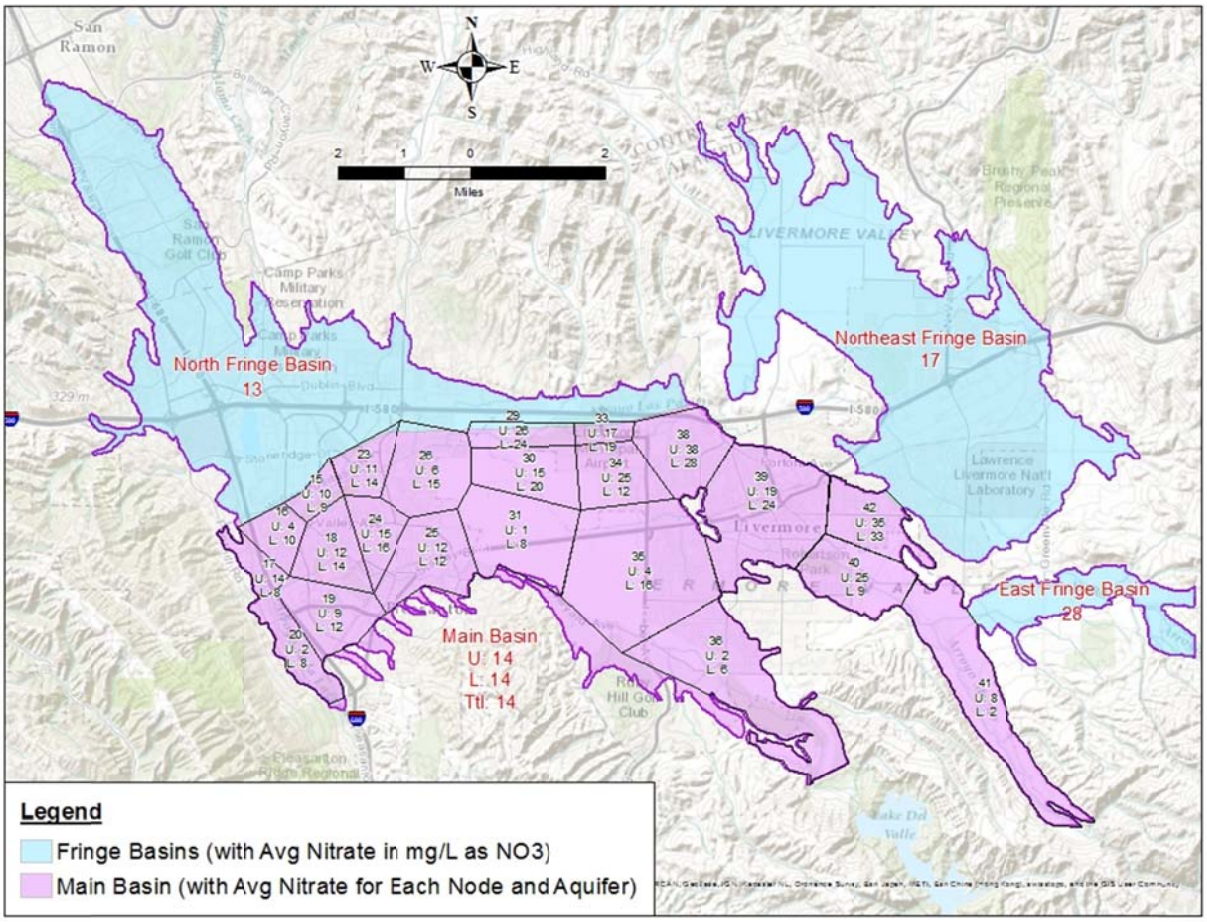
Groundwater Quality (Section 6)

Groundwater quality is generally good in the Main Basin. The main constituents of concern involved with meeting the Regional Water Quality Control Board's (RWQCB's) Basin Plan Objectives are salts (TDS) and nitrate.

The calculated basin-wide average TDS concentration at the end of the 2014 WY was approximately 598 mg/L, with the upper aquifer averaging 680 mg/L and the lower aquifer

averaging 509 mg/L. The Basin Plan objective is 500 mg/L for the Main Basin. Zone 7's approved Salt Management Plan (SMP) provides a long-term plan for meeting this objective.

Figure ES-6: Average Nitrate Concentration by Subbasin (2014 Water Year)



There are plume-like nitrate "hot spots" distributed across the Main and fringe basins, however the aquifer weighted basin-wide average nitrate concentration is 14 mg/L (as NO_3), well below the Basin Plan objective of 45 mg/L (*Figure ES-6*). For the 2014 WY, the average nitrate concentration was 14 mg/L in both the upper and lower aquifers.

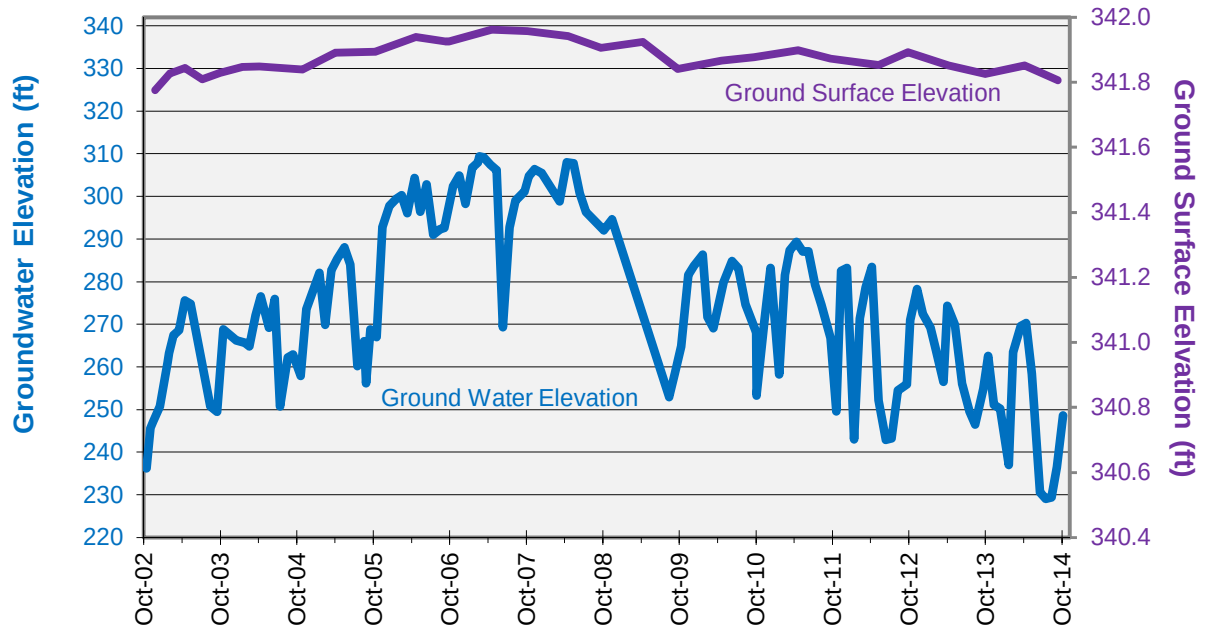
Boron is a natural occurring element typically found at very low concentrations in groundwater from the Livermore Groundwater Basin. While there is no maximum contaminant level (MCL) for boron, it is a problem for some irrigated crops when it exceeds 1 or 2 mg/L, depending on the crop's sensitivity. Boron concentrations in the lower aquifers of the Main Basin are generally below 2 mg/L throughout the lower aquifers, but exists at elevated concentrations (up to 32.9 mg/L) in the upper aquifers mainly in two areas of the groundwater basin: 1) in the eastern fringe basin area, and 2) along the boundary between the Main Basin and the Dublin and Camp fringe

basins. The occurrences of boron in groundwater are depicted in *Figures 6-6 and 6-9* of the main report.

Land Surface Elevation (Section 7)

There were localized minor declines in surface elevations, of up to 0.08 feet (0.96 inches) in the Amador and Bernal Subbasins since the end of 2013 WY. *Figure ES-7* shows the variation in land surface elevations observed near the Mocho Wellfield from 2002 through the 2014 WY. Based on the data collected for the Surface Elevation Monitoring Program, there was no indication that inelastic subsidence occurred anywhere in the valley during the water year due to groundwater pumping.

Figure ES-7: Surface Elevation and Groundwater Levels at Mocho Wellfield



Wastewater and Recycled Water (Section 8)

Approximately 5,300 AF of the 18,623 AF of the wastewater produced in the Valley (about 28%) was recycled and used for landscape irrigation in the 2014 WY. The City of Livermore (LWRP) produced and applied about 2,140 AF of the recycled water while Dublin San Ramon Services District (DSRSD) generated and used about 3,150 AF. About 66% (1,413 AF) of the recycled water produced by LWRP was applied over the Main Basin; whereas the remainder was applied on areas outside of the Main Basin; primarily on fringe basin and upland areas north of the Main Basin. All of DSRSD's recycled water was applied on areas north of the Main Basin. The recycled water from both wastewater plants met the State Division of Drinking Water "Title 22" water quality standards for irrigation uses during the 2014 WY.

It is estimated that less than 3% of the Main Basin's groundwater inflow component (i.e., recharging waters) in the 2014 WY was the result of applied recycled water percolating beyond

the root zones. More important, however, the use of recycled water to irrigate urban landscape conserved up to 5,300 AF of groundwater storage, assuming that the irrigation demand would have been met with groundwater supplies in the 2014 WY.

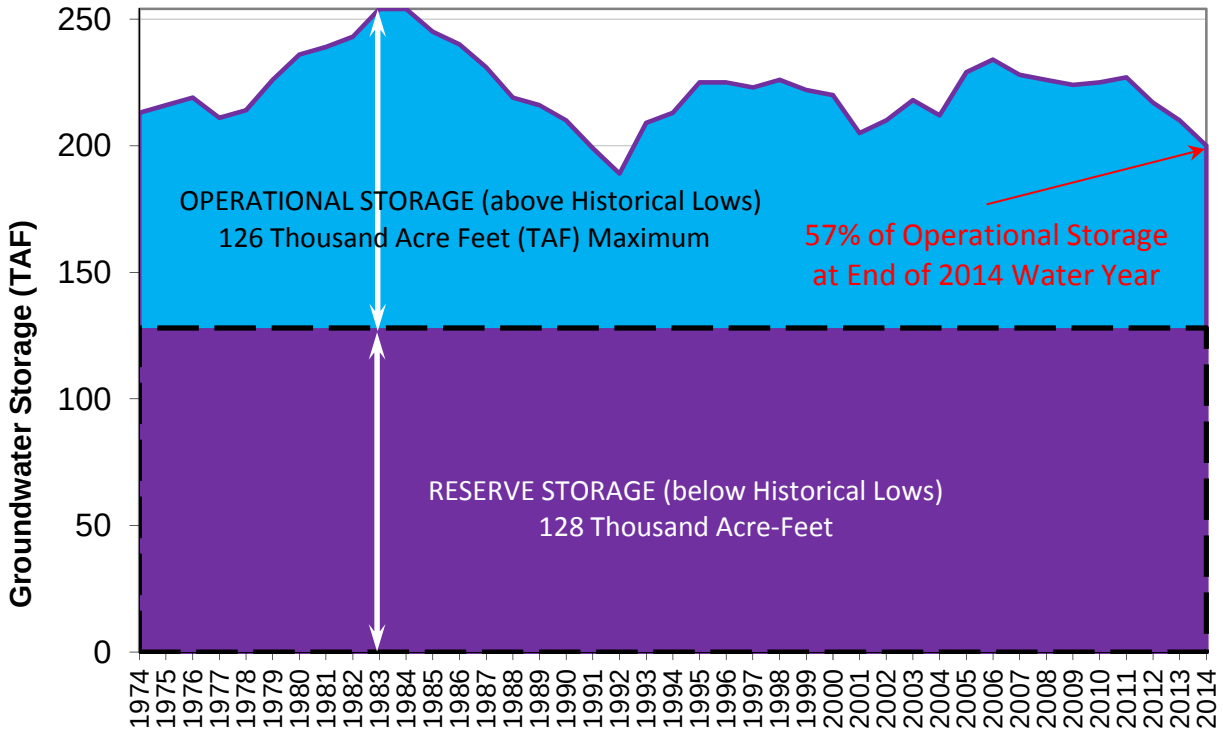
Land Use (Section 9)

The biggest change in land use over the last two years was the commercial and residential development along El Charro Road and Fallon Road (both, north and south of Interstate 580), and the addition of some irrigated vineyards in South Livermore. Otherwise land use remained similar to the 2013 WY.

Groundwater Storage Management for Sustainability (Section 10)

During the 2014 WY, groundwater supplies stored locally in the Main Basin decreased by approximately 10,000 AF. As a result, the 2014 WY ended with an estimated 200,000 AF of groundwater in total storage and 72,000 in operational (available above historical lows) storage. This represents about 57% of the Main Basin's operational storage capacity.

Figure ES-8: Groundwater Storage (1974 to 2014 Water Years)



Groundwater Supply Sustainability (Section 11)

Groundwater supply sustainability is evaluated as two main components:

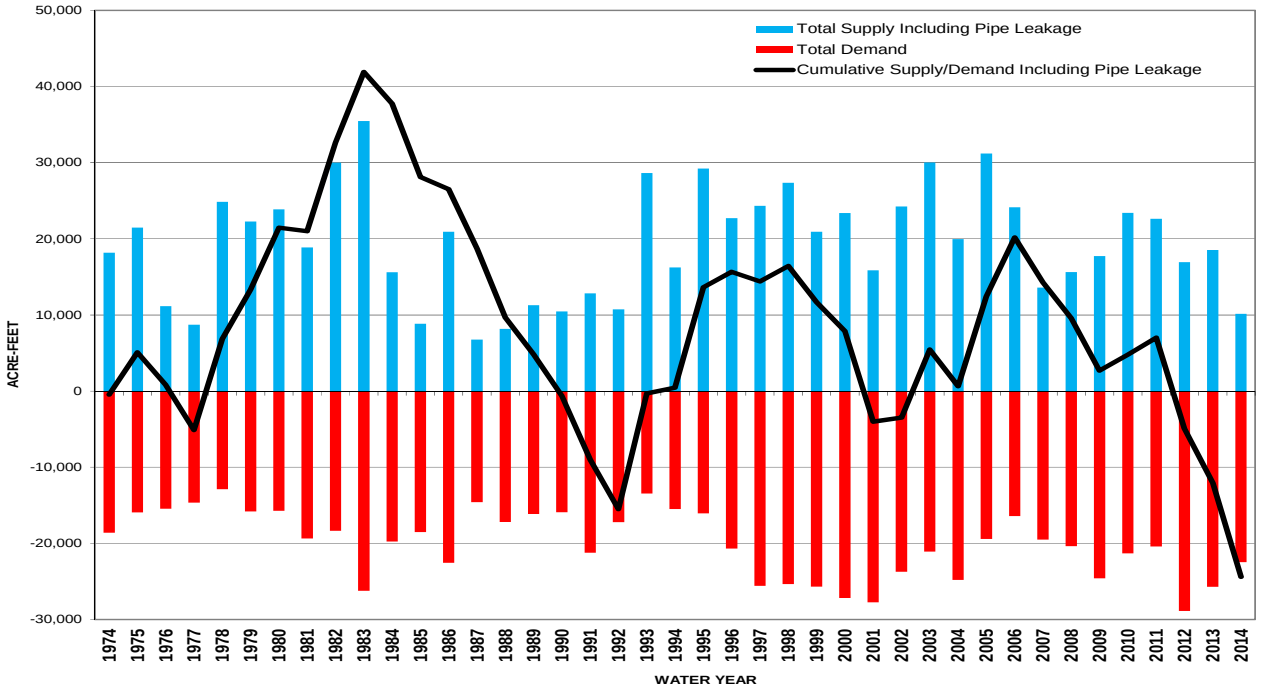
- Natural Sustainable Yield Supply and Demand
- Zone 7 Supply and Demand

The Natural Sustainable Yield Supply components include the aquifer recharge derived from natural stream flows, rainfall, irrigation percolation, and subsurface inflow. The demand components assigned to the Natural Sustainable Yield include all groundwater pumping except the Zone 7 pumping, and the mining area losses (i.e., pond evaporation, discharge outflow, and exported gravel moisture). The Zone 7 Supply and Demand components refer to the artificial recharge (supply) and municipal pumping (demand) that Zone 7 achieves each water year.

In the 2014 WY, the total Natural Sustainable Yield demand was 14,300 AF, while the total Natural Sustainable Yield supply was 6,100 AF. For the Zone 7 components, 8,100 AF was pumped from the Main Basin compared to 3,800 AF that Zone 7 artificially recharged in the 2014 WY.

On average, the Natural Sustainable Yield Demands have outpaced the Natural Sustainable Yield Supply components since 1974; however, because the Zone 7 Supply has outpaced the Zone 7 Demands during the same period, the net result demonstrates sustainability of the current conjunctive use of the groundwater basin (see *Figure ES-9* below*)*. The supply/demand deficit depicted for the last three years in *Figure* is the short-term effect of very low rainfall and stream recharge that occurred during this drought period. A similar deficit was experienced during the 1987-92 drought, which was then followed by several years of normal rainfall and stream recharge that replenished groundwater storage. This is consistent with Zone 7's Basin Management Objectives of adding to storage during wet years and withdrawing during dry years.

Figure ES-9: Main Basin Sustainability

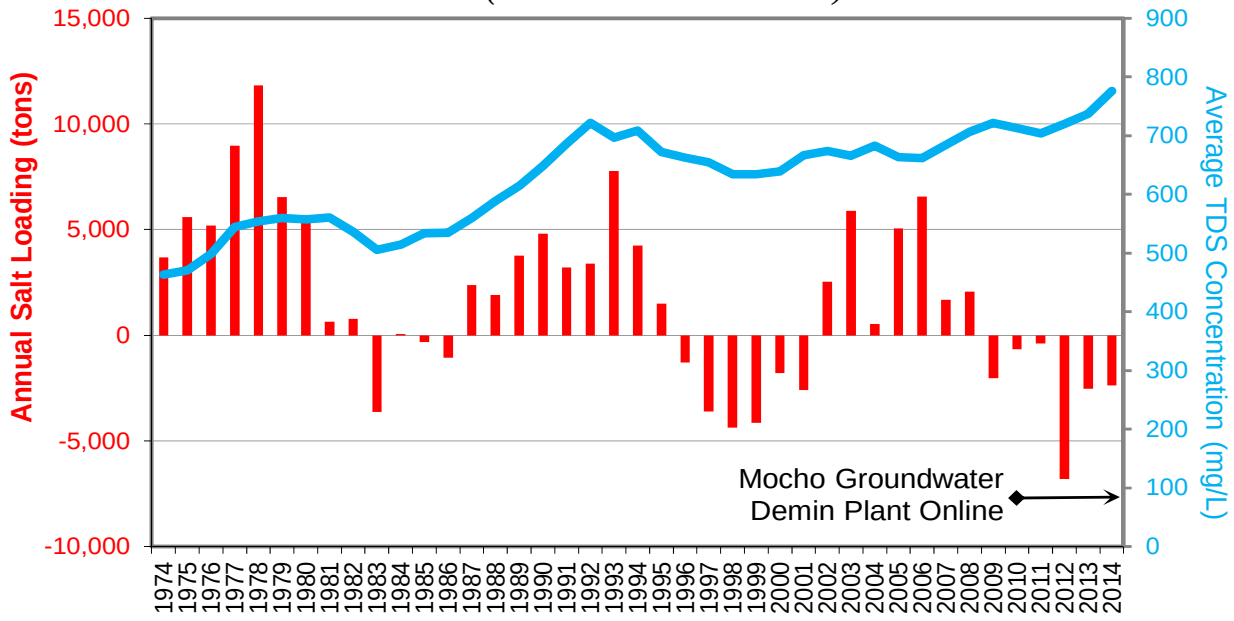


Water Quality Sustainability (Section 12)

Hydrologic conditions and water operations in the 2014 WY resulted in a net removal of approximately 2,400 tons of salt from the Main Basin. This includes an estimated 1,050 tons of salt that was concentrated and exported from the Main Basin by Zone 7's Mocho Groundwater Demineralization Plant (MGDP), which was operated only sparingly to maintain membranes during the water year to conserve groundwater that would otherwise be exported as brine concentrate had the MGDP run more. Since the MGDP began operating in 2009, approximately 14,800 tons of salt have been removed from the Main Basin.

In addition to calculating the average TDS concentration in the upper and lower aquifers from the monitoring well samples (see Groundwater Quality Section above), Zone 7 tracks a running theoretical basin-wide average TDS concentration by dividing the inventoried salt load at the end of each water year by the year-end inventoried groundwater storage (*Figure ES-10*). Although the net salt loading (in terms of mass) has been negative during each of the last six years, the theoretical basin-wide average TDS has risen 72 mg/L (from 704 mg/L to 776 mg/L). This counter-intuitive trend is largely due to the combined effect of lowering storage by pumping relatively low TDS water for municipal supply while the average TDS concentration of the recharge components were higher than average because of drought impacts. In essence, the average TDS concentration of all the recharge waters was higher than the average concentration of the extracted water extracted, thus the concentration increased. *Figure 12-3* of the main report shows the salt loading and its effect on the basin since 1974.

Figure ES-10: Main Basin Salt Loading and Theoretical TDS Concentration (1974 to 2014 Water Years)



Zone 7 also tracks nutrient concentrations in groundwater, primarily nitrate and phosphate. In general, there is not a nutrient loading problem in the groundwater basin; however, there are a few areas with high nitrate concentrations that are believed to have been caused mainly by historical agricultural and municipal wastewater practices that are no longer being employed over the groundwater basin. Nonetheless, in the 2014 WY, Zone 7 staff worked toward completing a Nutrient Management Plan (NMP), which when completed and combined with Zone 7's SMP, together will be equivalent to the Salt/Nutrient Management Plans described in the State's 2009 Recycled Water Policy. Zone 7 is scheduled to complete the NMP in 2015.

Zone 7 manages three other groundwater protection programs for the purpose of groundwater quality sustainability, namely:

- Septic Tank Management;
- Well Ordinance/Well Permitting, and
- Toxic Site Surveillance

No special authorizations for septic tank use within the Upper Alameda Creek Watershed were made in the 2014 WY. In 2014, the RWQCB issued Waste Discharge Requirements for the onsite wastewater treatment systems in use at the Concannon Winery which expire in 2016.

In the 2014 WY, Zone 7 issued 181 drilling permits, 23 more than were issued in 2013. Zone 7 permit compliance staff inspected approximately 40% of all permitted well work in the 2014 WY. The remainder were allowed to self-monitor with required reporting.

Zone 7's Toxic Site Surveillance program tracked the progress of 53 active contamination cases where contamination has been detected in groundwater or is threatening groundwater. Thirteen of the sites are designated as "High Priority" because they have impacted or are an immediate threat to potable water supply wells or surface water. Nine of the high priority sites are fuel leak cases; the other four cases involve solvent contamination (tetrachloroethylene [PCE]). Thirteen contamination cases were closed during the 2014 WY after they were determined to no longer pose a threat to drinking water. At the end of the water year, eleven other toxic site cases were being considered for closure, including three of the high priority cases.